Peri-urban Dry Season Vegetable Production in Ibadan, Nigeria

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Keywords : Management practices – Vegetable production – Peri-urban – Dry season.

Summary

Peri-urban dry season vegetable production in Ibadan is increasingly becoming important, due to its relatively recent importance as a means of producing food in the city. Information on : (1) management practices; (2) cropping systems; and (3) economics of production, was hardly available. A diagnostic study organised in the dry season of 1994/95 addresses these issues. Its results indicate that the major crops in the system are Corchorus, Amaranthus *and* Celosia *and are grown in intercropping systems. Farmers in the systems were constrained by poor drainage systems, weeds, dearth of improved seeds and marketing, inefficient input delivery system, high cost of input, pests and diseases and unavailability of labour at critical times. However, net benefits amounts to approximately N235650/ha/season ($ 2772). Significant and sustainable increases in productivity of the system could be achieved with the use of integrated water, crop, soil and pest management systems together with efficient input delivery systems.*

Résumé

La production alimentaire péri-urbaine pendant la saison sèche à Ibadan devient de plus en plus importante. Les informations sur : (1) les méthodes d'exploitation, (2) les systèmes de culture et (3) la production économique, étaient à peine disponibles. Une étude diagnostique de ces sujets a été organisée pendant la saison sèche de 1994/95. Les résultats montrent que les cultures principales dans le système étaient Corchorus, Amaranthus *et* Celosia *et qu'elles sont cultivées en utilisant le système de culture dérobée. Dans ce type de système, les fermiers sont handicapés par un mauvais drainage, les mauvaises herbes, la pénurie de semences améliorées et la commercialisation inefficace, un faible système de distribution des facteurs de production, des prix élevés des intrants, des pestes et maladies et le manque de main d'œuvre au moment opportun. Cependant les bénéfices nets se sont élevés aux environs de N235650/ha ($ 2772). Un accroissement significatif et soutenable dans la productivité du système ne pourrait être obtenu que dans un système de gestion intégrée de l'eau, des cultures, du sol et des ravageurs avec une distribution adéquate des facteurs de production.*

Introduction

Throughout subsaharan Africa, increasing population pressures, coupled with declining economic fortune of most countries has led to increased agricultural production within the precints of major cities. For the urban majority of poor people in Africa, food is turning into a very expensive commodity. In 1990, households in nearly half of the developing countries largest cities were spending 50-80% of their average income on food (4). When it comes to food, poor people in cities have fewer coping strategies than rural inhabitants. Price surveys of developing countries have shown that city dwellers pay between 10-30% more for their food than rural dwellers. This has therefore led to renewed interest in urban agriculture (4).

The practice of producing food in the cities dates back to Inca, Aztec and Maya cities, early Japanese and Indus settlements and towns of Tigris and Euphrate. In present days, more advanced urban agriculture is typically found in Asian cities where policy makers and planners have for some time accepted and promoted food production as a critical urban function. In Nigeria, peri-urban agriculture has been expanding since the late 1980s in many cities. Multiple factors came into play : rapid urbanization, ineffective agricultural policies, cripple food distribution systems, withdrawal of subsidies, reduction of wages, inflation, unemployment and lax urban regulations among other factors.

Vegetable production is one of the most important enterprises of peri-urban production systems in Nigeria because vegetables are an important component of human diet and they can be easily cultivated on small areas. Furthermore, they are efficient sources of many micronutrients both in unit cost of production and per unit area of land. Whereas the Food and Agricultural Organization of the United Nations (FAO) and the World Health Organization (WHO) recommend a daily vegetable intake of 200 g per person, the Nigerian national average is well below this value (2). This inadequate intake of fresh vegetables may further be worsened during the dry season when moisture availability limits the area and quantity of vegetables that can be grown and supplied to the urban centers.

The presence of virtually assured markets in urban areas, with their high concentration of people dependent on purchases for most of their food need, is very conducive to intensive vegetable production close to cities. Increased peri-urban vegetable production by small scale farmers close to major urban centers could significantly increase the availability of vegetables in

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urban markets, reduce malnutrition, and transportation costs, minimize produce spoilage, while at the same time provide farmers with an assured source of income (1). These developments could also lead to increased employment for rural and urban people, particularly women (3).

Ibadan is one of the most populous indigenous cities in subsaharan Africa with an estimated population of over 2 million people (7). The city depends to a large extent on small scale vegetable producers located within and around the city especially in the dry season for its daily supply of vegetables.

To provide an adequate supply of vegetables to a rapidly growing city such as Ibadan, reliable information is needed, to provide a detailed description of vegetable growing practices in the peri-urban belt of Ibadan. This preliminary study was, therefore, designed to : describe cultivation methods, provide estimates of production costs and profitability of peri-urban vegetable production, investigate production constraints faced by peri-urban vegetable growers (including those of agronomic and pedological nature) and identify opportunities for improving the system.

Material and Methods

The study was conducted during January and February 1995 in and around Ibadan City. Ibadan is located in the humid forest/moist savanna transition zone (210 meter above sea level, 7° 30'N, 3° 54'E). Annual rainfall pattern is bimodal, with about 120-128 rainy days, and it amounts to 1200-1400 mm. Rains usually begin in April and end in November, with a mid season dry spell in July and August. November to April is the dry season. Total class a pan evaporation is 1550-1500 mm per annum. Annual mean, maximum and minimum temperatures are 24-29° C, 27-34° C, and 20-30° C, respectively. Mean relative humidity is 64-83%. The locations studied included Ajao, Awo stream, Eleyele and Kongi-Bodija. These locations were chosen because they represented the typical urban vegetable production systems within and around Ibadan. Seventy farmers randomly selected within the study area were interviewed using a combination of structured open ended questionnaires and informal yet structured rapid rural appraisal of the major vegetable production systems. The survey team was made up of agronomists, extension agronomists, socio-economists and the extension agents in the respective extension blocks of the Oyo state agricultural development project (OYSADEP) Ibadan zone.

Through these approaches, general description of the system, the cropping systems, the management, productivity and the constraints facing the systems were investigated.

Results

Background Information and Farm Features of peri-urban dry season Vegetable Production System in Ibadan.

Farms studied ranged between 0.01-0.03 ha in size. Farms were relatively smaller within the city (Kongi-Bodija) than on the outskirt e.g. Awostream (Table 1).

Majority of the respondents were part time farmers i.e. they were either farmers who cultivate food crops during the rainy season, artisans, unemployed youths, civil servants and/or immigrant farmers who decided to augment their income from these off-season activities. Ninety six percent of the operators were tenants and their plots are rented annually either from landowners (Eleyele, Kongi-Bodija) or from government (Ajao).

Table 1. Background information and farm features of peri-urban dry season vegetable production system in Ibadan.

	Location			
	Ajao	Awostream	Eleyele	Kongi-Bodija
Number of farms sampled	12	22	18	18
Average farm size (ha)	0.01-0.25	0.03-0.30	0.01-0.3	0.01-0.1
Number of respondents				
Gender profile				
Male	9	20	17	18
Female	3	2	1	-
Farmers disposition (%)				
Part time	83	87	68	92
Full time	17	13	32	8
Tenure status (%)				
owner	-	10	-	-
cultivators	100	90	100	100

System Components

Peri-urban dry season vegetable production in Ibadan takes place in inland valleys between October and May of each year. Thereafter, most of the farms become flooded because of early rains. Land clearing is carried out in October, followed by planting operations. Plantings are either on ridges or raised beds depending on the depth of the water table and time of the year. A typical cropping calendar for the systems is shown in Figure 1.

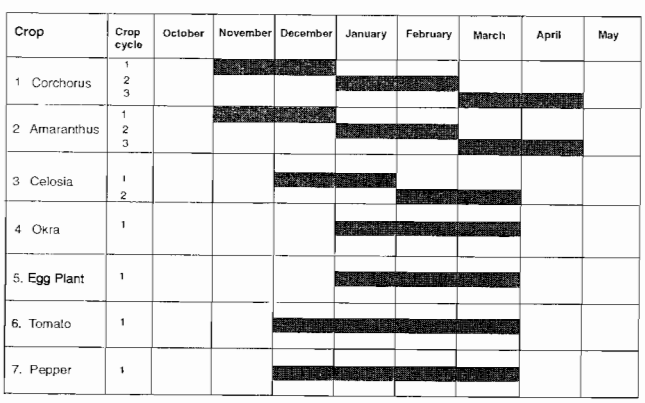

Figure 1. Vegetable crop calendar during the dry season in peri-urban production system in Ibadan.

Three to four cropping cycles of a particular vegetable is common depending on growth duration, other crops in the mixture and market preferences. Ninety six percent of the farmers source(s) their seeds from their own reserve or at local markets within the city. Direct seeding of the vegetables is adopted by the majority of farmers, except for chilli pepper and tomato. High seeding rates are also employed to safeguard against poor viability of seeds because of doubtful seed quality and to suppress weeds (Table 2).

Table 2. Typical seeding rate of leafy vegetables in the peri-urban system in Ibadan.

Vegetables	Quantity of seed used (kg/ha)	NIHORT[1] recommendation (kg/ha)
Corchorus olitorius	60-75	5-8
Amaranthus cruentus	8-10	1.5
Celosia argentea	10-15	2.0

[1] NIHORT – National Horticultural Research Institute production guide for respective vegetable

Source : (6)

Crops planted

The major crops cultivated are *Corchorus*, leafy *Amaranthus* and *Celosia* in that order (Table 3).

Table 3. Relative abundance of vegetables (% of farmers) within the peri-urban system in Ibadan.

Crops	Location				Systems Average
	Ajao	Awo-stream	Eleyele	Kongi-Bodija	
n	12	22	18	18	70
Corchorus (*Corchorus olitorius*)	100	100	100	100	100
Amaranthus (*Amaranthus cruentus*)	100	100	100	100	100
Celosia (*Celosia argentea*)	100	64	54	50	67
Okra (*Abelmoschus esculentus*)	33	59	39	*	33
Egg plant (*Solanum gilo*)	25	*	*	*	6
Tomato (*Lycopersicon esculentus*)	33	*	28	*	15
Pepper (*Capsicum annum*)	*	*	44	*	11

* = indicate no response n = number of respondent

Cropping Systems

The majority of farmers (89%) practices one form of intercropping or the other, depending on the types of crop grown and time of the year. The dominant intercropping systems are presented in Table 4.

Table 4. Common vegetable - crops combination in the peri-urban system in Ibadan.

Locations	Mixtures
Ajao	Corchorus + Amaranthus Corchorus + Soyabeans Celosia + Okra + Egg plant Okra + Celosia + Maize + Amaranthus Tomato + Amaranthus
Awo Stream	Corchorus + Amaranthus Corchorus + Okra Okra + Celosia + Maize Corchorus + Maize + Amaranthus + Pepper
Eleyele	Corchorus + Amaranthus Corchorus + Amaranthus + Okra Celosia + Amaranthus + Tomato Corchorus + Celosia + Egg plant + Pepper
Kongi-Bodija	Amaranthus + Corchorus Amaranthus + Celosia

System Management

Weeding

Weeding is carried out either with hoe or by hand pulling, depending on the crops grown and cropping systems. For example, hand pulling is carried out when leafy vegetables, such as *Corchorus* and *Amaranthus*, are intercropped because their seeds are broadcast at high density.

Water management

Water management involves the digging of drainage channels for excess water, especially at the beginning of the cropping season (October) when the water table is high. Other methods include the construction of raised beds or heaps and digging of water holes or shallow wells to get water. Water is supplied manually with buckets, watering cans or with the aid of a portable petrol water pump during the peak of the dry season especially from March to April.

Soil Fertility

Soil fertility is managed either by depending on native fertility of the soil or by the application of inorganic fertilizer mainly (NPK 15-15-15), especially on plots that carry *Corchorus/Amaranthus* and are cropped for up to three to four cycles before the end of the season. Fertilizer rates in such system range from 300-900 NPK/ha per season.

Pests and Diseases

The incidence of pests especially leaf eating insects are relatively higher compared to diseases. Pests and diseases are controlled by the application of pesticides and the use of natural plan products, such as wood ash mixed with water, ripe papaya fruits mixed with water etc. depending on the severity of infestations.

Harvesting

Leafy vegetables are harvested by uprooting about three times starting 30 days after planting. The interval

between each harvest date is approximately one week. Fruit vegetables e.g. Okra (*Abelmoschus esculentus*), is harvested when nature depending on the variety.

Labour

Farmers either manage the field themselves, use family labour or hire labour for various field operations. Labour used varies from 3000-10.000 man h/ha, with initial clearing operations, construction of drainage channels and seed bed preparations accounting for this high labour use.

Marketing and Input-Output Relationships

Farmers sell their produce either through : (1) market women; (2) by taking the produce directly to the market individually; or (3) through the sale of standing crop to market women.

Table 5 shows the crop budget of *Corchorus*/leafy *Amaranthus* intercrop, the dominant intercropping system in the peri-urban system in Ibadan. Total input costs in this system are N22.950/ha/season. The cost of seeds amounts to 55% of the total physical input costs. Besides physical inputs, *Corchorus/Amaranthus* cultivation also requires an intensive use of labour. Total labour costs of this system is N20.400 ha of wich 61% is incured during land preparation. The total costs of *Corchorus/ Amarantus* cultivation (physical input + labour input) is N43.350/ha. Gross benefits amount to N279.000/ha. The net benefit is therefore N235.650/ha (Table 5).

Table 5. Crop budget (N per/ha) for *Amaranthus/Corchorus* cultivation in the peri-urban system in Ibadan.

	Quantity	Price (N/unit)	Value (N)/ha
A. Physical inputs			
1. Seeds (kg)			
- *Amaranthus*	10	150	1 500
- *Corchorus*	75	150	11 250
2. Cost of fertilizer NPK 15-15-15 (kg)	900	500	9 000
4. Agrochemical - Cymbush (1)	1	600	600
5. Tenancy cost (ha)	1	600	600
Total inputs cost			22 950
B. Labour (hours)			
6. Land preparation	2 000	6,25	12 500
7. Bed preparation	160	6,25	1 000
8. Planting	280	6,25	1 750
9. Weeding	344	6,25	2 150
10. Harvesting	480	6,25	3 000
Total labour cost			20 400
Total cost (A+B)			43 350
C. Output/gross benefits			279 000
D. Gross margin (C-A)			256 050
E. Net benefits (C-A-B)			235 650

Note : 85 Nigeria Naira (N) = 1 US $

Farmers' Aspirations Concerning Vegetables

At Awo stream, Ajao, Kongi-Bodija and Eleyele 89, 93, 74 and 80% respectively of the farmeres planned to cultivate vegetables or increase their holdings during the dry season in the future. Whereas farmers in Ajao and Eleyele grow vegetables for both home consumption and sale, those of Kongi-Bodija cultivate vegetables mainly for sale (Table 6). Vegetable preferences varied slightly with location but *Corchorus, Amaranthus* and *Celosia* were the common favourites (Figure 2).

Table 6. Reason for growing dry season vegetables (% of farmers) in the peri-urban system in Ibadan.

System	Location				Average
	Ajao	Awo-stream	Eleyele	Kongi-Bodija	
n	12	22	18	18	70
Home consumption	31	17	24	0	18
Sale	69	83	76	100	82

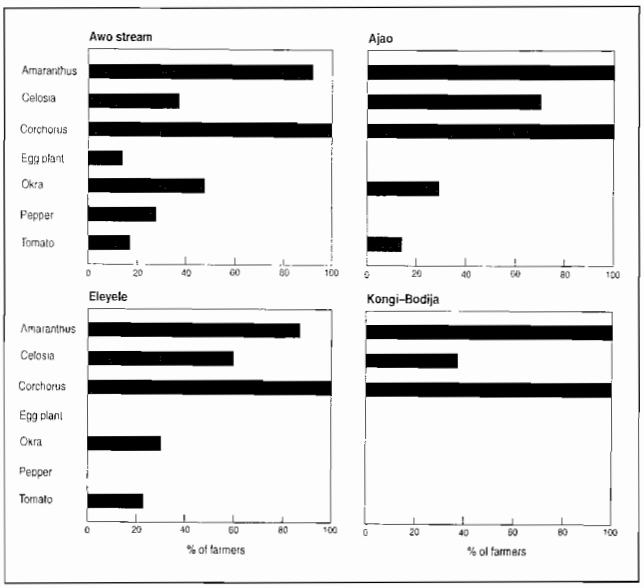

Figure 2. Vegetable crop preferences by farmers in peri-urban production system in Ibadan.

Constraints

Despite the enthusiasm showed by the farmers with respect to dry season vegetable production within the peri-urban system, farmers in the system were constrained by some problems (Table 7). These include among others : high cost of input, dearth of improved seeds and marketing, weeds, poor drainage system, inefficient input delivery system, lack of appropriate management system, etc. (Table 7).

Table 7. Relative importance of constraints (% of farmers) to dry season vegetable growing in the peri-urban system in Ibadan.

Constraint	Location				Systems Average
	Ajao	Awo-stream	Eleyele	Kongi-Bodija	
n	12	22	18	18	70
Abiotic					
Water management/ poor drainage system	83	86	78	77	81
Biotic					
Pests and diseases	75	32	72	61	60
Weed	83	91	89	78	85
Socio-economic					
unavailability of labour at critical time	75	86	44	39	61
Lack of capital for initial establishment	50	82	77	61	68
Land shortages	25	32	39	61	39
Dearth of improved seeds and marketing	100	100	100	100	100
Inefficient input delivery system	83	77	72	67	75
High cost of input	100	100	100	100	100
Poor coverage and quality of extension services	42	36	83	89	63
Lack of appropriate management technologies	58	82	78	83	75

Discussion

Peri-urban agriculture has several advantages if the potentials are fully utilised especially in areas with high population density, like Ibadan. From this study, it is clear that farmers in htis system try to maximize their resources amidst several abiotic and biotic stresses, and socio-economic contraints.

The preponderance of leafy vegetables over fruit vegetables suggests that leafy vegetables should be the target of research effort to improve the system.

Furthermore they have shorter growth duration (< 50 days) enabling farmers to have up to three crop cycles before the rainy season. This also allow farmers to defray costs they incur in establishing fields at the beginning of each cropping season. Presently in Nigeria, fruit vegetables like tomatoes and peppers that have longer shelf lives than most leafy vegetables are grown in commercial quantities in large irrigation schemes in the north during the dry season and are then transported to the urban centers in the south. Hence it is economically wise, and also for nutritive purposes for the farmer to cultivate leafy vegetables that have shelf life of less than 48 h close to the urban markets in Ibadan.

Peri-urban dry season vegetable production takes place in inland valleys. As a result, appropriate water management or drainage system is an important component of an ecologically sustainable dry season vegetable production. However, the cost of developing this system on individual farmer basis is very high because of land tenure systems. Therefore, the operation of the National Fadama Project, the authority that has the mandate to develop inland valleys in Nigeria should be integrated to cover urban production systems. In areas prone to drought, boreholes, wash tubes or tube wells could be sunk to complement natural recharge towards the end of the season, when water shortage becomes acute. Research initiatives to improve this system should therefore focus on :

(1) physical characterization of inland valleys with respect to their potentials;

(2) development of appropriate drainage/water management or conservation systems; and

(3) breeding for water use efficiency in leafy vegetables.

Diseases and pests particularly reduce yield and quality of produce but most vegetable growers suffer from lack of information about pests and diseases and their management, while integrated pest management practices are practically unknown. Research efforts should therefore focus on environmentally friendly ways of producing vegetables such as pesticide-free farming. In recent years pesticide free cultivation of vegetables has received increased attention due to rising awareness among consumers regarding the adverse impact of excessive use of pesticides on human health. This is of particular importance because short season leafy vegetables are the dominant types within the peri-urban system in this study. Short season vegetables usually have pesticides residues at harvest since little time exists for pesticide degradation in the system (1).

Indiscriminate use of pesticides could also be sources of pollution of water both for industrial and domestic uses. For example at Eleyele, farmers cultivate the basin of the Eleyele dam which is the source of raw water of Eleyele water works that supply treated water for about a quarter of the population of Ibadan. Indiscriminate use of pesticides at Eleyele basin could, therefore, pose serious health harzard in the long run. Farmers should therefore be trained on the technology of using pesticides. Weeds have long been recognized as a serious limiting factor to dry season vegetable production in the inland valley systems in general (5). The rational approach in this system would be to adopt integrated weed management systems (IWM). Current weed control practices by farmers also need to be studied and improved upon.

Labour shortages in this system suggest that vegetable growing has to compete with other urban activities reducing labour. Critical labour shortage could be reduced by reducing drugery of operations, especially labour required to clear the plots and for the construction of drainage channels at the beginning of the cropping season could be mechanized.

The input delivery system is inefficient resulting in scarcities or even lack of inputs at critical times and high cost for the farmers. This is more serious with respect to the cost of fertilizers. The state has the monopoly of fertilizer distribution and marketing in Nigeria. The system needs to be privatized to allow efficient allocation of resources. Furthermore, the use of inorganic fertilizers should be complemented with

organic manures e.g. the use of composted household refuse that is generated in sufficient quantities within Ibadan metropolis. This would enhance nutrient recycling since leafy vegetable production is a potential source of export of nutrient from the system. Seed quality and availability also represent major difficulties within the peri-urban system. Therefore credible seed certification and marketing should be encouraged by the government so that stable yielding varieties, with durable pest resistance could be made available to farmers to increase the productivity of the system.

Despite all these constraints however, the net benefit obtained from this system still seems to be an attractive return relative to maize/cassava intercrop, the dominant cropping system in rural area of this zone.

Conclusion

Peri-urban dry season vegetable production has high potential in Ibadan. Significant and sustainable increases in the productivity of the system could be achieved with the use of integrated water, crop, soil and pest management practices including organic and inorganic soil management, manual, cultural and chemical weed management and efficient input delivery systems.

Acknowledgement

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Literature

1. AVRDC. 1993. AVRDC 1994 Progress Report. Asian Vegetable Research and Development Center. Shanhua, Taiwan, Taiwan (ROC). 537 pp.
2. FAO. 1991. Food Balance Sheets, 1984-86 Average Rome, Italy.
3. Hayami, Y., Kawagoe, T., Yokoyama, S., Bagyo, A.S., & Zakaria, A.K. 1990. Marketing innovation for vegetables : Conditions of Diversification in Upland Farming. ESCAP CGPRT Center and Bogor Research Institute for food crop, Indonesia, 120 pp.
4. IDRC. 1993. Farming in the city. The rise of Urban Agriculture. International Research development Center of Canada, vol.. **12**, 3, 1-24.
5. Izac, AM.N., Swift, M.J. & Andriesse, W., 1991. A strategy for inland valley agroecosystems research in West and Central Africa. Resource and Crop Management Program. International Institute of Tropical Agriculture. Ibadan, Nigeria, 22 pp.
6. NIHORT. 1985. National Horticultural Research Institute. Guide to the production of *Amaranthus telfairia* and *Corchorus*.
7. NPC 1991. National Population Commission. Provisional census results for Nigeria 1991.

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In Memoriam

G. Chauvaux

Le Conseil d'Administration, le Comité de Rédaction d'Agri-Overseas/Tropicultura, et son secrétariat ont le profond regret de vous annoncer le décès inopiné de

Monsieur **Guy Chauvaux**,

survenu le lundi 18 janvier 1999,

et présentent à la famille leurs très sincères condoléances.

De Raad van Beheer, het Redactiecomité van Agri-Overseas/Tropicultura, en de Secretariaat melden U met diepe droefheid het plotse overlijden van

de heer **Guy Chauvaux**

op maandag 18 januari 1999,

en bieden aan de familie hun oprecht medeleven aan.